

Expectation 5: Human Impact on Earth's Systems

The student will use concepts from chemistry, physics, biology, and ecology to analyze and interpret both positive and negative impacts of human activities on earth's natural systems and resources.

INDICATORS	OBJECTIVES	ISSUES and IDEAS	RESOURCES
<p>Indicator 1: The student will analyze the effects of human activities on earth's natural processes.</p>	<p>a. Identify and describe that natural ecosystems provide an array of basic processes that affect humans. Those processes include:</p> <ul style="list-style-type: none"> • maintenance of the quality of the atmosphere • generation of soil • control of the hydrologic cycle • disposal of wastes • recycling of nutrients <p>b. Investigate and explain that humans modify ecosystems as a result of:</p> <ul style="list-style-type: none"> ○ Population growth ○ Technology <ul style="list-style-type: none"> • Technologies having to do with food production , sanitation, and disease prevention ○ Consumption <ul style="list-style-type: none"> • Increasing human consumption places severe stress on the natural processes that renew some resources and it depletes those resources that cannot be renewed <p>c. Investigate, analyze and explain how ecological forecasts are used to predict the impacts of chemical, biological, and physical changes on ecosystems, ecosystem components, and people.</p>	<p>a. Explain that human populations use natural systems, and will continue to use natural systems, as resources in order to maintain and improve their existence.</p> <p>b. Human activities can induce hazards and accelerate natural change through resources acquisition, urban growth, land-use decisions, and waste disposal.</p> <p>c. Natural systems have the capacity to reuse waste, but that capacity is limited.</p> <p>d. Materials from human societies affect both the physical and chemical cycles of earth</p> <p>e. Human impacts are threatening current global stability and if not addressed, earth's systems will be irreversibly affected.</p>	<p><u>NOAA Links Ecological Forecasting</u></p> <p><u>NOAA National Buoy Center live data</u></p> <p><u>Digital Library of Earth Systems Education</u> Excellent lessons</p> <p><u>Ecological Forecasting Lessons</u> <u>The Stinging Sea</u> Predicting the Presence of Sea Nettle in the Chesapeake Bay-limiting factors</p> <p><u>The Dead Zone</u> Gulf of Mexico "Dead Zone" – nutrient overload, design an experiment</p> <p><u>Managing the Everglades Ecosystem</u> - Explore the Everglades ecosystem using the Internet. To develop an understanding about conservation of resources in the context of the Everglades; explore relationships between species and habitats; and develop an understanding of how human beings have altered the equilibrium in the Everglades</p> <p><u>Click here for original lesson source</u> (MAC and PC) <u>Dirty Mud Lesson -</u> <u>Dirty Mud Data</u> Sediment Contamination Identify specific types of wetland habitats and land uses in a watershed; explain how data on chemical contaminants, land uses and habitat types can be integrated to develop restoration plans for environmental resources damaged by pollution.;use a geographic information system to retrieve and analyze data about specific benthic marine habitats.</p> <p><u>Get to the Point!</u> See also Expectation Environmental Health Nonpoint source pollution Describe at least five sources of nonpoint source pollution runoff.; at least three contaminants likely to be found in urban runoff, and discuss possible sources of these contaminants; discuss how bioassays may be used to measure toxicity, and describe three examples; compare and contrast toxicity tests and chemical analyses of potential contaminants, and explain how these may be used to identify areas affected by nonpoint source pollution; describe and discuss at least five actions that can be taken to reduce</p>

Expectation 5: Human Impact on Earth's Systems

The student will use concepts from chemistry, physics, biology, and ecology to analyze and interpret both positive and negative impacts of human activities on earth's natural systems and resources.

			<p>or eliminate contaminated runoff.</p> <p>The Seeds Tell the Story See also Expectation Environmental Health Bioassays to measure toxicity of nonpoint source pollution Describe at least five sources of nonpoint source pollution runoff; describe and discuss at least five actions that can be taken to reduce or eliminate contaminated runoff; define and discuss the meaning of toxicity, dose, sensitivity, and route of exposure; explain the concept of a "dose-response relationship," and discuss why this relationship may not be adequate to define "safe levels" of potentially toxic substances; explain why bioassays may provide a more realistic picture of toxicity than chemical analyses alone.</p>
<p>Indicator 2. The student will investigate and analyze human activities that can deliberately or inadvertently alter the equilibrium of natural processes, including maintenance of the quality of the atmosphere.</p>	<p>a. Human activity may alter the equilibrium of natural processes</p> <ul style="list-style-type: none"> • generation of soils • control of the hydrologic cycle • disposal of wastes • recycling of nutrients • changing the rate at which matter recycles 	<p>Tie to Systems, Equilibrium, Thermodynamics, biogeochemical cycles</p> <p>Soils Topics: erosion, agriculture, desertification, development, deforestation, salinization</p> <p>Hydrologic Cycle Topics: distribution, irrigation, agriculture, dams, impervious surface; drought</p> <p>Wastes Topics: water pollution, ocean pollution, air pollution, solid waste; development of new materials; radioactive waste</p> <p>Recycling of Nutrients Topics: fertilizers, pesticides, new non-biodegrading materials, solid waste;</p> <p>Changing the rate at which matter recycles: Global Climate Change, Abrupt Climate Change</p> <p>a. Greenhouse gases in the atmosphere such as CO₂ and water vapor, are transparent to much of the incoming</p>	<p>Fix It! Natural Resource Restoration Identify at least three examples of natural events and human activities that injure coastal resources; describe at least three cases in which injured coastal resources have been restored by human activity; describe at least three ways that people have been able to contribute to coastal resource restoration.</p> <p>SAV Me! Natural Resource Restoration (Submerged Aquatic Vegetation Define submerged aquatic vegetation, and describe at least three benefits that SAV provides to humans and other species; describe typical causes for reduced SAV coverage in coastal ecosystems; describe at least three actions that can be undertaken to restore SAV in depleted areas; describe and discuss a research project that could provide information to help improve SAV restoration programs.</p> <p>Water Science for Schools: USGS Water Information aspects of water, including text, pictures, data, maps, and an interactive center.</p> <p>Pesticides: Can We Do Without Them? Case study in which students use information on pesticide use presented to them from the perspective of different stakeholders.</p> <p>Soils Around the World</p>

Expectation 5: Human Impact on Earth's Systems

The student will use concepts from chemistry, physics, biology, and ecology to analyze and interpret both positive and negative impacts of human activities on earth's natural systems and resources.

		<p>sunlight but not to the infrared light from the warmed surface of the earth.</p> <p>b. When greenhouse gases increase, more thermal energy is trapped in the atmosphere and the temperature of the earth increases.</p>	More like these
Indicator 3. The student will analyze the relationship between human activities and the earth's resources.		<p>a. The development of new materials and increased use of existing materials by a growing human population have led to the removal of resources from the environment much more rapidly than they can be replaced by natural processes.</p> <p>b. The earth has finite resources.</p>	
	<p>a. Evaluate the interrelationships, from local to global levels, between humans and water.</p>	<p>a. Water Issues</p> <ul style="list-style-type: none"> Fresh water supply, distribution and uses Chemical and physical changes to water (thermal, pollution, toxics) Ocean issues <p>b. Actions/ Responses: water conservation, water and sewage treatment, prevent pollution and sedimentation</p>	<p>Where's the Point?</p> <p>Explain at least five sources of contaminated runoff and their impact on coastal ecosystems and resources; five actions that can be taken to reduce or eliminate contaminated runoff; construct a three-dimensional model of an actual watershed, and use this model to provide information on contaminated runoff to a specific target audience.</p>
	<p>b. Evaluate the interrelationships, from local to global levels, between humans and land.</p>	<p>a. Land Issues</p> <ul style="list-style-type: none"> Changes in land use - Development & smart growth, wetlands destruction, farming Chemical and physical changes to land –fertilizer, pesticides, hazardous waste, overgrazing Food production, transport and distribution Mining <p>b. Actions/ Responses: Smart Growth policies, sustainable agriculture, recycling, mitigation, consumption of</p>	<p>Do You Have Change?</p> <p>Coastal Change Analysis</p> <p>Explain how satellite imagery can be used to monitor land use change; construct a change table to summarize land cover information; use a change table to make inferences about land use changes in a coastal region.</p>

Expectation 5: Human Impact on Earth's Systems

The student will use concepts from chemistry, physics, biology, and ecology to analyze and interpret both positive and negative impacts of human activities on earth's natural systems and resources.

		local products; decreased consumption	
	c. Evaluate the effects on the environment of human activities that result from the acquisition, transport, distribution and use of energy resources.	Energy Issues <ul style="list-style-type: none"> The acquisition, distribution and use of all types of energy resources have advantages and disadvantages. Actions/ Responses – Investigation and evaluation of types of energy resources.	
	d. Evaluate the interrelationships, from local to global levels, between humans and air quality.	Tie to climate change, weather, environmental health Issues Actions/ Responses –	
	e. Recognize and explain that activities and technology of the human species have a major impact on other species in many ways such as: <ul style="list-style-type: none"> Decreasing the amount of available space (land use) or food for other organisms Destruction of habitats through direct harvesting, pollution, atmospheric change Removing or moving a species from one ecosystem to another Changing the temperature and chemical composition of habitats Altering organisms through selective breeding and genetic engineering 	Issues <ul style="list-style-type: none"> Wildlife, plants , animals, decomposers/microbes, fisheries Decreasing Biodiversity <ul style="list-style-type: none"> Habitat fragmentation Monoculture GMF Chemical effects on organisms (pesticides, fertilizer) Genetic alteration of organisms for food and medicine Consumption and overconsumption Adding or removing a species Actions/ Responses – IPM, seed banks, zoos, habitat restoration, consumption reduction, composting, farming practices, predator reintroduction, removing invasive species	
	f. Analyze ways that humans are changing many basic ecosystem processes and explain that the changes may have a major impact on their own species in many ways.	Tie to natural hazards, ecology, environmental health <ul style="list-style-type: none"> Natural systems can change to an extent that exceeds the limits of organisms to adapt naturally or humans to adapt technologically. Human activities can enhance potential for hazards. 	

Expectation 5: Human Impact on Earth's Systems

The student will use concepts from chemistry, physics, biology, and ecology to analyze and interpret both positive and negative impacts of human activities on earth's natural systems and resources.

DRAFT